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APPLICATION OF A METHOD FOR DETERMINING INFORMATION REQUIREMENTS IN A FIELD ARMY

James M. McKendry, et al

Army Research Institute for the Behavioral and Social Sciences
Arlington, Virginia

August 1973

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Technical Paper 247

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James M. McKendry, Reese C. Wilson, Douglas J. Mace,
and James D. Baker

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SYSTEMS INTEGRATION & COMMAND/CONTROL TECHNICAL AREA

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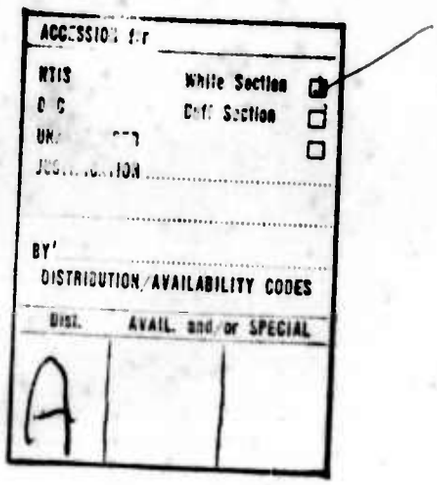

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13. ABSTRACT

Within the Army Research Institute, the Command and Control Work Unit Area is concerned with human factors problems of information presentation, processing, and utilization in command and control systems. The Army has under development a number of automatic information systems aimed at expediting tactical staff operations in the field, by providing vital information to staff officers in sufficient detail at appropriate times. The research presented here provided techniques and data for more effectively evaluating one of these systems, the Tactical Operations System (TOS) in the Seventh Army in Europe, and its user information requirements.

A survey instrument was devised from analysis of staff journal entries made during field training and command post exericses. The survey listed 61 common information items, with subdivisions indicating level of information detail desired. Subjects checked which items, in how much detail, were most important to them in the field. Responding were 86 experienced staff officers, from four staff elements--G2 (Intelligence), G3 (Operations), FSCE (Fire Support Coordination Element), and CBRE (Chemical, Biological, and Radiological Element)--and from two separate Corps, from Infantry and Armored divisions, and from three echelons of command (Army, Corps, and Division). The officers' subjective judgments were converted to scores which permitted each officer's response to receive equal weight even though the number of information items considered crucial by each officer varied from person to person.

General interest patterns were found to be almost exclusively a function of the staff element in which a person served. G2 and G3 personnel required the greatest

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13. ABSTRACT - Continued

variety of information, CBRE the least. There was general agreement on which items were most important within each staff element, and general disagreement between staff elements, which indicates that the specific interest patterns for each element should be viewed separately in determining staff information requirements.

The methodology and techniques employed here for determining user information requirements are capable of producing criteria for measuring how thoroughly information is disseminated in a given system. Beyond this immediate use, such methodology and techniques could prove useful for generating staff/user information requirements for a variety of Army tactical data systems, which in turn could influence data base structure and display design.

FOREWORD

The Command and Control Work Unit within the U. S. Army Research Institute for the Behavioral and Social Sciences (ARI) is concerned with human factors problems of information presentation, processing, and utilization in command and control systems. One major objective is to provide research findings by which information assimilation and decision making may be facilitated. There is a concomitant requirement for research to determine how human abilities can be utilized to enable the command information processing system to function with enhanced effectiveness. The entire research effort is responsive to requirements of RDTE Project 2Q062106A723, "Human Performance in Military Systems," FY 1973 Work Program, and to special requirements of the Combat Developments Command, and the Project Manager's Office, Army Tactical Data Systems. The bulk of the research described herein was sponsored by the U. S. Army Research Institute under contract DA 8C-19-68-C-006. Some of the data gathering was performed under contract DAAK-02-68-C-0509 to the U. S. Army Computer Systems Command.

The U. S. Army currently has under development a number of command information processing systems (e.g., TOS, TACFIRE, ATMAC), the objective being to maximize combat effectiveness by optimum utilization of human abilities supplemented by automated devices. The present publication describes one effort which provided techniques and data for more effectively evaluating manned systems performance.

J. E. UHLANER
Technical Director

APPLICATION OF A METHOD FOR DETERMINING INFORMATION REQUIREMENTS IN A FIELD ARMY

BRIEF

Requirement:

To establish a criterion measure for use in the Seventh Army Tactical Operations System (TOS) evaluation.

Procedure:

Eighty-six experienced staff officers in the U. S. Seventh Army, Europe, contributed data through a survey instrument devised from a detailed analysis of numerous staff journal entries made over a series of field training exercises (FTXs) and command post exercises (CPXs) within Seventh Army. The subjective judgments of these officers were converted to scores by means of a unique scaling technique described in the report. In essence, this scoring technique permitted each officer's response protocol to receive equal weight even though the number of information items considered crucial by each officer varied from person to person. Responses were obtained from officers in four separate staff elements, G2 (Intelligence), G3 (Operations), FSCE (Fire Support Coordination Element), and CBRE (Chemical, Biological and Radiological Element), from two separate corps, from divisions of two types (Infantry and Armored), and from three echelons of command (Army, Corps, Division).

Findings:

An individual's staff element defined his general interest pattern almost exclusively.

Specific interest patterns correlated very well within the four staff elements and very poorly between staff elements.

The methodology and techniques employed here for determining staff user information requirements are capable of producing criterion values for measuring dissemination thoroughness in tactical operations systems.

Utilization of Findings:

These findings provided a criterion for assessing how thoroughly information was disseminated within a given system. Beyond this immediate utilization, the results from this effort suggest that the methodology and techniques employed could prove useful for generating staff/user information requirements for a variety of Army tactical data systems which, in turn, could influence data base structure and display design. For example, in a military information system, the user interacts with the internal workings of the machine as well as interfacing with the external surfaces of the machine. Therefore, the information the user needs to access and manipulate in order to make critical decisions must be known if the program logic is to work toward optimizing the personnel component of the system and to display it to him in a timely and unambiguous manner.

APPLICATION OF A METHOD FOR DETERMINING INFORMATION REQUIREMENTS IN A FIELD ARMY

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APPLICATION OF A METHOD FOR DETERMINING INFORMATION REQUIREMENTS IN A FIELD ARMY

INTRODUCTION

A series of technologically sophisticated automatic data processing (ADP) systems are now being developed for the United States field armies. These mobile systems are aimed at expediting tactical staff operations in the field during the 1970 time frame. All have the goal of providing vital information to staff officers in sufficient detail at appropriate times.

A prototype version of one of the command-control systems, termed the Tactical Operations System (TOS), was tested by the United States Seventh Field Army located in West Germany. The prototype TOS, in essence, derived from determinations made during a series of analyses of manually conducted field and command post exercises. These examinations addressed themselves to the question of what operations and functions could, and should, be automated. During the analyses, the flow of information through the manual system was found to be slow and error prone. Staff officers frequently were devoting so much effort to mundane information processing tasks that they lacked the capacity to evaluate effectively the meaning of the information in terms of enemy actions and friendly unit capabilities. At every echelon of command, it was found that great amounts of manpower and effort were being spent in general information processing activities associated with particular identifiable functions. These functions were designated as priority groups for automation, and thus the prototype TOS evolved.

The Seventh Army version of the TOS provided information for two major and two subordinate staff elements at three separate echelons of command (Army, Corps, and Division). The two major staff elements that interacted with the TOS were the G2 (Intelligence) and G3 (Operations). The two subordinate elements were FSCE (Fire Support Coordination Element) and the CBRE (Chemical, Bacteriological and Radiological Element). An overview of this system, and a summary of some of the human factors efforts which accompanied its development, may be found in a publication by Baker.[1]

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[1] Baker, J. D. Acorns in flowerpots/psychologists in the field. Proceedings: U.S. Army Human Factors Research and Development Sixteenth Annual Conference, El Paso, Texas. 1970. (Paper available through the American Psychological Association Journal Supplement Abstract Service).

Since the TOS was not an automated system "built from the ground up" but rather a system configured by automating functions typically processed manually, the opportunity existed to assess the benefits achieved by selective introduction of automation. Performance during completely manual operations was to be compared to performance after the introduction of automation. The methodology, criteria, and measurement techniques deveoped to accomplish this are described in a previous report.[2]

One criterion selected for comparing the information processing effectiveness of the two approaches was dissemination thoroughness, i.e., the percentage of messages arriving at the proper destination. Within a manual system, the routing function is performed by personnel who are, through training and experience, aware of the information needs of various users in the system--or so it is assumed. Within an automated system, desired information can be automatically routed to a particular user. In either case, the requirement exists to determine, as the data come into the system, which of the geographically separate users should be the recipients of messages containing specified classes of information.

This dissemination problem can be viewed from two standpoints: underdissemination and overdissemination. With too little data (underdissemination), the user cannot get the job done. With overdissemination, on the other hand, the user wastes time screening data for relevant information. Also, where overdissemination exists the purchase, maintenance, and transportation of more hardware than is actually required can be the result. The trick is to determine the "happy medium," i.e., the user's basic information requirements.

The present publication describes the efforts involved in generating data to meet these base-line information requirements. While the original work was conducted to fulfill a specific short-term field evaluation requirement, the establishment of a criterion measure for use in the TOS evaluation, the overall findings may be of general interest to those involved in military information system developments. But a desirable end-product from any research endeavor is the development of methodology and techniques which have the potential for application beyond the narrow scope of a given study. Such tools can prove a handy addition to the human factors practitioner's bag-of-tricks. It is the delineation of the methodology and techniques for determining user information requirements, therefore, which is the primary objective of the present report.

METHOD

A survey instrument was devised after a detailed analysis of numerous staff journal entries made on a series of field training exercises (FTXs)

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[2] Krumm, R. L. Measurement of Tactical Military Information Flow. Proceedings: U.S. Army Human Factors Research and Development Thirteenth Annual Conference, Ft. Monmouth, N. J. 1967.

and command post exercises (CPXs) within Seventh Army. Sixty-one entries which appeared routinely were noted--e.g., first border crossing by an enemy unit, major bridge destroyed, friendly unit situation report. The survey instrument listed these items and, under each item, further entries were provided to indicate the level of information detail desired, e.g., enemy unit identification at division, regiment, or battalion levels. Based upon a priori analysis of content, the 61 items were divided into three groups: 34 dealt with information about the enemy that is other than CBR in nature; 16 dealt with non-CBR friendly unit information; 11 dealt with CBR items specifically.

A total of 86 experienced staff officers were surveyed. The principal staff officer (e.g., the army, corps, or division G2) in each staff section completed one form and designated which other staff officers should respond. A minimum of two officers or senior noncommissioned officers were surveyed at each separate staff element--e.g., the CBRE at a particular division. Subjects checked which of the 61 items were most important to them in the field. They were given a guideline of making anywhere from 10 to 30 checks. Once the checks were made, officers reviewed the items selected and indicated the level of information detal they desired.

Statistical analyses of these data were conducted to answer the following questions: 1) Are there clear, discernible differences between staff elements in terms of the types of information they perceive as most valuable? 2) To what extent do idiosyncratic demographic factors influence the type of information desired by staff elements? For example, do desires change in accordance with the echelon of command at which an individual serves or the type of unit involed (infantry vs. armored division) or the particular corps to which he is assigned? 3) To what extent do staff officers agree concerning the items of information they feel are important? 4) Can items of information be ordered or scaled in terms of their perceived importance?

Scaling Method

Because of the nature of the problem, conventional scaling techniques were not applicable. The reasons were threefold. First, it was difficult to specify in advance just how many items of information would be considered crucial by a single staff officer. Recognizing that a response protocol that listed everything as being "crucial" gave no information concerning the relative value of certain items on the list, broad limits were set concerning the number of selections a respondent could make (10 to 30). This requirement meant that for each rater the number of items being considered varied--a feature diametrically opposed to most conventional scaling procedures where a small fixed number of items are presented many times. The second reason was that conventional scaling techniques tend to take time--more time than busy staff officers can spare. Third, the number of items to be scaled (61) was too large to permit normal treatment. For example, if a paired comparison scaling technique were used, a total of 1,830 judgments would have been required for each rater. Further, even rank ordering the items presented a

difficult task for the raters--one which senior staff officers seemed unlikely to accept. For these reasons, subjective judgments were converted to scores by means of a scaling technique previously employed.[3] Since the number of checks made varied from rater to rater, it was necessary that each subject's response protocol receive equal weight, a result achieved by assigning 100 points to each rater. If he made 10 checks, each check was given 10 points, if 33 checks were made, each was worth 3.33 points, etc.

Rating Method

After being told of the purpose of the quesionnaire, raters were instructed as follows:

> The attached check list contains 61 information items that routinely appear in exercise staff journals. Please perform the four-step process described below:
>
> 1. Briefly review the 61 information items in the context of your element's CPX mission.
>
> 2. Circle from 10 to 30 of the 61 items of information that are most important to the successful completion of your element's tactical mission most of the time (in the CPX context). Do not consider unlikely situations and highly specialized information requirements.
>
> 3. For the 10 to 30 information items you have designated as most important, check the appropriate right-hand boxes indicating the level of interest within your own (geographical) sector and adjacent sectors, if appropriate. The level of interest may differ between sectors because of terrain peculiarities.
>
> 4. List any information items important to your element's CPX mission that were not included in the 61 on the last page. Also make any clarifying remarks or suggestions on the last sheet or adjacent to the appropriate information item.

After complying with these instructions, officers were told they could, if they felt it was absolutely necessary, use a few more than 30 checks.

---

[3] McKendry, J. M., Harrison, P., Birnbaum, A., and Sadacca, R. Estimating the value of surveillance information using error cost matrices. ARI Technical Research Note 184. June 1967. (AD 667 390)

Content of Questionnaire

Items on the questionnaire were grouped under one of three major headings: 1) Information about the enemy other than CBR. There were a total of 34 items within this major heading: Five items dealt with movement to contact; nine dealt with enemy tactical actions; twelve dealt with enemy unit locations; six with enemy losses; and two items dealt with other factors. 2) Non-CBR friendly unit information. This major heading contained 16 items. Three items dealt with friendly unit locations, three with friendly unit tactics, five with friendly unit status and strength, and five items with summary reports. 3) CBR activities. The last major grouping contained 11 items. Five listed enemy CBR activity, four dealt with relevant meteorological data, and two with friendly CBR activities.

Data gathering was conducted over a three-month period. Personal visits were made to each unit; questionnaires were distributed and explained; questions were answered; and follow-up visits were made. On the whole, cooperation was excellent.

ANALYSIS

Analysis conducted viewed information requirements in two ways; first, as a set of general interest patterns--where attempts were made to isolate the demographic factors (staff element, echelon of command, type of unit, and corps assignment) crucial in determining a staff officer's general information needs. Second, as a set of specific needs--where the survey contents were examined on an item-by-item basis for each general interest group defined the first set of analyses.

General Interest Patterns

The major analytical tool used in the first approach was the analysis of variance (ANOVA). Two sets of analyses were conducted: 1) Impact of staff element vs echelon of command on general information requirements. 2) Degree and nature of the impact of staff element, type of unit, and corps assignment on the emphasis placed in the three topic areas. In terms of the questions listed at the close of the method section, analyses attempted to answer the first two--"1) Are there clear, discernible differences between staff elements in terms of the types of information they perceive as most valuable?" "2) To what extent do idiosyncratic demographic factors influence the type of information desired by staff elements?" In addition to these major analyses, the amount of information desired by each staff element was compared by a simple tabulation of the number of items checked on the survey.

Specific Needs

The second approach utilized a different set of analytical tools--the key one being Pearson product-movement correlation coefficients.

These permitted the average importance scores for one group of uses for all 61 items to be contrasted on an item-by-item basis with those of another group of users, the groups being defined by the general interest patterns uncovered by the first analysis. Similar comparisons were made within a group to determine the extent of agreement between members of that group and between groups as well as to determine the extent of overlap of interest from group to group. These analyses were aimed at answering questions 3 and 4 of those listed in the method section: "3) To what extent do staff officers agree concerning the items of information they feel are important?" "4) Can items of information be ordered or scaled in terms of their perceived importance?"

FINDINGS

Results obtained with two general approaches are discussed separately below, beginning with the attempt to define groups of officers with general interest patterns.

General Interest Patterns

Data for the first set of analyses of variance utilized all 86 protocols--all Ss at the 4 staff elements at all 3 echelons of command. Analyses were in the context of a 4 (staff elements) x 3 (echelons of command) two-factor analyses of variance. The 4 x 3 analysis was repeated three times--for 1) enemy, 2) friendly unit, and 3) CBR information.

Results of these bi-variate analyses are shown in Table 1. To take account of the fact that there were an unequal number of respondents in the 12 different combinations of variables, a least-squares solution was used.

The three tests showed similar results (Table 1). Staff element had a significant impact on the importance attached to all three types of information, while echelon of command did not. In fact, echelon of command not only had no impact by itself, but it also failed to show any significant interaction with staff elements. By contrast, staff element effect was not only statistically significant, but huge. In the importance attached to CBR information, for example, the F-ratio for staff elements was 148.91 for 3/86 degrees of freedom (a figure of 4 or more was significant at the .01 level).

The easiest way to grasp just how great the impact of staff elements was is to compute the percentage of the total variance that can be accounted for by that one factor alone. In the case of the importance of enemy information, the most common type of item, staff elements accounted for 80.5% of <u>all</u> the variance. In the case of friendly unit information, the figure was 67.1%. For CBR importance scores, it was 82.8%. The meaning of these very large figures is that if protocols of 86 respondents are pooled and the variation is measured from subject to subject in the total sample, 67.1% to 82.8% of all of the variation is

Table 1

SUMMARY OF FIRST THREE ANALYSES OF VARIANCE, CONTRASTING IMPACT OF STAFF ELEMENT AND ECHELON OF COMMAND UPON GENERAL INFORMATION REQUIREMENTS

	Source	Sums of Squares	df	Mean Square	F
Friendly Unit Information	(A) Staff Element	11,809.44	3	3,936.48	58.25*
	(B) Echelon	3.87	2	1.93	.03
	A x B	400.29	6	66.72	.99
	Error	5,001.20	74	67.58	--
	Total	17,214.79	85		
Chemical, Biological, and Radiological Information	(A) Staff Element	43,611.19	3	14,537.06	148.91*
	(B) Echelon	348.46	2	174.23	1.78
	A x B	992.31	6	165.38	1.69
	Error	7,224.17	74	97.62	
	Total	52,176.13	85		
Enemy Information	(A) Staff Element	41,663.81	3	13,887.94	99.77*
	(B) Echelon	364.69	2	182.35	1.31
	A x B	1,711.41	6	282.23	2.05
	Error	10,300.98	74	139.20	
	Total	54,040.89	85		

*$p < .05$

accounted for by staff element, that is, by dividing the scores into four piles--G2, G3, FSCE, and CBRE. In contrast, knowing the echelon of command in which a person worked would tell nothing of any significance regarding the importance subjects attached to each of the three general categories of information.

The second set of three analyses of variance dealt with the impact of staff element, type of unit, (Armored vs Infantry), and corps assignment upon general information requirements. Results are shown in Table 2. In all three cases, staff elements accounted for more than two-thirds of the variance--69% for friendly unit information, 77% for CBRE information, and 70.1% for enemy information.

Results of all three analyses are consistent with previous findings that the staff element in which a man serves determines to a large extent his general information requirements. Further, if attention is restricted to the major staff elements G2 and G3, very little variation from element to element occurs as a function of idiosyncratic demographic factors such as the type of unit assignment of the corps in which one serves. That is, practically all the interaction effects were noted in the FSCE and CBRE (minor staff) elements.

Amount of Information Desired

One index of the amount of information desired is the number of items checked by a staff officer. Recall that subjects were instructed to make anywhere from 10 to 30 checks. During pretesting, it soon became apparent that some respondents found it difficult to stay within these limits. Therefore, verbal instructions were added to treat the 10 to 30 figures as a guideline and not as an unbreakable rule. A total of 23 subjects went outside the suggested guidelines. Surprisingly, 2 CBRE officers made less than 10 checks (5 and 7). The remaining 21 subjects required more than 30 checks--2 subjects from the FSCE, 9 from G2, and 10 from the G3. All except three of the cases (2 G3s and 1 G2) used less than 40 checks.

An inspection of the data showed that CBRE officers consistently checked fewer items than was the case for the other three staff elements. For example, the median number of items checked by the 14 CBRE officers was 13 with a range from 5 to 29. Only two of the 14 scores exceeded 16. By contrast, the 14 FSCE officers surveyed selected from 14 to 39 items with a median of 24. Only two of their scores exceeded 30. The G2 and G3 groups diverged even further from the CBRE group in terms of number of items checked. Both had a median of 30. For the G2 group, the range was 18 to 37. In the case of the G3 officers the range was 10 to 28. The difference between the FSCE and these two major staff elements (G2 and G3) did not appear to be of any practical significance. These data suggest a much more specialized type of interest (a narrower one) in the CBRE staff than in any of the others. By contrast, judging from comments made to the authors while they were collecting data, G3 officers have especially wide interests and want large quantities of information.

Table 2

ANALYSES OF FACTORS AFFECTING THE IMPORTANCE ATTACHED TO VARIOUS TYPES OF INFORMATION BY FOUR DIFFERENT STAFF ELEMENTS IN EACH OF TWO CORPS HAVING TWO DIFFERENT TYPES OF UNITS (ARMORED AND INFANTRY)

		Variable 1 Friendly Unit Information		Variable 2 Enemy Information		Variable 3 Chemical-Biological-Radiological Information	
Source	df	Mean Square	F	Mean Square	F	Mean Square	F
Staff Element (A)	3	1,963.57	36.60*	6,773.26	76.00	8,429.10	250.85*
Unit Type (B)	1	42.74	F < 1	202.96	2.00	59.43	1.77
Corps (C)	1	8.08	F < 1	262.89	3.00	363.13	10.81*
A x B	3	32.10	F < 1	389.66	3.37*	387.73	11.54*
A x C	3	160.61	2.99*	375.30	4.25*	865.13	25.75*
B x C	1	.38	F < 1	484.71	5.50*	457.80	13.62*
A x B x C	3	36.91	F < 1	676.66	7.67*	469.50	13.97*
Error	33	53.65	---			33.60	-----
Total	48						

*p < .05

Specific Information Needs

The general analyses made it fairly clear that respondents could logically be grouped into four categories according to their general interest patterns: G2, G3, FSCE, and CBRE officers. Once this was done, the extent of detailed agreement within each group concerning which items are important was computed by contrasting the scores of officers in Corps A with those in Corps B. Estimates were then made of the reliability of a single combined scale for both corps, using the Spearman-Brown prophecy formula. The combined scales were then intercorrelated to show the similarity of detailed interests between the four staff elements. When the two sets of correlational analyses were completed, the set of 61 items were then examined for the G2 and G3 sections to indicate how items could be grouped into various perceived importance categories. The nature of the distribution of perceived importance scores for each of the four scales was examined also.

Correlational analyses. The split-group reliability coefficients for the G2 and G3 officers had 11 subjects per split group (corps). In the case of FSCE and CBRE officers, there were only 6 subjects per split group. The summed importance scores for the 6 CBRE officers in Corps A were contrasted with summed importance scores for the 6 CBRE officers in Corps B. All within-group correlation coefficients were high--.869 for G2's, .868 for G3's, .684 for FSCE's, and .933 for CBRE's. Scores were then combined over both corps, and the reliability of the new scale was estimated by use of the Spearman-Brown prophecy formula. These figures appear in the diagonal cells of Table 3. The levels of significance for an r with 60 degrees of freedom are .250 at the .05 level and .325 at the .01 level. From the table, it is apparent that while the specific information needs within a staff element are perceived very similarly, agreement across staff elements is slight, at best.

Distribution. A description of the distribution of item scores for the four staff elements is shown in Table 4. The G2, G3 and FSCE scales, while exhibiting varying degrees of negative skewness, appeared to be continuous. In the case of the CBRE staff, the distribution appeared to be bimodal with most of the cases appearing in the highly negatively skewed portion of the distribution. This feature of the CBRE distribution probably depressed the correlation between it and other staff elements and made the intercorrelation coefficients between CBRE and other staff officers less meaningful than one would wish. While the correlation between CBRE and other elements may be artificially depressed, the coefficients do indicate that the specific information needs of the CBRE are substantially different from those of the other three groups--a difference very clear from inspection of the raw data.

For the other three staff elements, scores were sufficiently well distributed to satisfy assumptions basic to computation of the product-moment correlation coefficients. From the nature of the distribution of G3, G2, and FSCE item scores, dividing these into priority groups involves a certain amount of arbitrariness as to where to draw the line between higher and lower priority items. In the case of CBRE items, choice of

Table 3

INDICES OF AGREEMENT BETWEEN STAFF ELEMENTS FOR THE 61-ITEM SURVEY

	G-2	G-3	FSCE	CBRE
G-2	(+.931)[a]			
G-3	+.231	(+.924)[a]		
FSCE	+.290	+.191	(+.806)[a]	
CBRE	-.024	-.024	+.377	(+.936)[a]

[a]Diagonal entries are estimated scale reliability coefficients computed by the Spearman-Brown approximation formula based upon split-group reliabilities.

Table 4

DISTRIBUTIONS OF SUMMED IMPORTANCE SCORES FOR THE 61 ITEMS IN THE SURVEY

	G2	G3	FSCE	CBRE
91-100	----	----	----	----
81-90	----	----	----	----
71-80	8	7	----	----
61-70	8	7	----	----
51-60	10	11	4	1
41-50	4	2	6	2
31-40	5	7	6	----
21-30	4	9	15	4
11-20	3	8	11	5
1-10	19	10	19	40
MDN	36.10	37.80	20.10	6.8
Mean	37.40	37.25	20.37	20.10

where to make separation is easier because there are clear breaks in the distribution. The problem of deciding where to divide a continuous distribution into groupings of items is similar to the one encountered by professors assigning letter grades of A, B, C, D, and F to a continuous distribution of student test scores. One device which helps put the scores in some perspective is to express each as a percentage of the highest score made in a group. In the case of the data from the survey, this type of conversion was especially meaningful because in all four staff elements some items got maximal scores--i.e., every subject checked them--and some had zero scores. Therefore, the new converted scores became some percentage of the maximum perceived interest.

CONCLUSIONS

Four specific conclusions and one general observation may be drawn from the work just presented.

1. General interest patterns were almost exclusively a function of the staff element in which the individual served (G2, G3, FSCE, and CBRE). In the case of the principal staff elements (G2 and G3), these general interest patterns were unaffected by echelon of command, type of division (Armored vs Infantry), or the specific corps to which assigned. In the case of the subordinate staff elements (CBRE and FSCE), general interests were influenced to some extent by idiosyncratic factors such as type of unit and corps assignment. However, these idiosyncratic factors were never more than 20% as strong as the staff element effect in defining general interest patterns. Because of the small sample and other considerations, the practical significance of these idiosyncratic variations can be questioned.

2. The variety of types of information desired by G2 and G3 personnel was substantial. The perceived needs of the FSCE were somewhat (but not clearly) less than those of the G2 and G3, and the needs of CBRE were substantially (and significantly) less than for any other element. These data pointed out the restricted, specialized nature of CBRE's general information interests.

3. When profiles of interests on an item-by-item basis are examined, it is obvious that there was a high degree of agreement within staff elements concerning what they considered most important, and what they considered of less importance. In the case of the G2 and G3 officers, for example, the split group correlation coefficients were in excess of .86. When different staff elements were compared, however, correlation coefficients were low and mostly non-significant, indicating that the specific perceived requirements of each of the four staff elements should be viewed separately.

4. Priority of perceived need scales for the 61 types of information listed in the survey can be constructed as a guide for determining the expressed needs of various staff elements in a Field Army.

One general observation also merits comment. It was noted at the outset that the research just reported was undertaken to provide data for a specific application. A need existed for baseline data which would delineate the information requirements of specific system users. These data were to provide a criterion for assessing the dissemination thoroughness capability of a given system. Determination of meaningful criteria in this type of setting has always been a knotty problem. As Leuba[4] has so wisely observed: "There are many ludicrous errors in quantification as it is practiced today, but none is quite as foolish as trying to quantify without a criterion. It is awkward enough to quantify the wrong thing when a criterion exists, but is a sham of the most unprofessional sort to quantify in the absence of a criterion. If a criterion does not exist it must be created. It may not be inferred." The results from this effort suggest that the methodology and techniques just described may prove to be useful tools for creating baseline criteria over a broad range of information systems.

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[4] Leuba, H. R. Quantification in Man-Machine Systems. Human Factors, 1964, 6, 556.